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ABSTRACT

One population at risk of academic failure comprises students who are of average ability, but who score significantly higher in nonverbal aptitude than verbal aptitude. Careful identification and instructional intervention can help these students to perform better. The findings of two studies are presented. The first study was conducted in 1964 among black sixth graders in an urban elementary school in Richmond (Virginia). The findings demonstrate that the verbal aptitude scores improved significantly when the students were given a planned program of verbal experiences. The second study was conducted in 1985 among 100 eighth graders, black students and white, from four rural and one urban school division in central Virginia. An analysis was made of the cognitive task performance of students with various levels of verbal and nonverbal functioning. Students with higher verbal scores performed better on tasks involving semantic content such as reading, language, social studies, and science. Those with higher nonverbal scores performed better on tasks involving symbolic content such as some multi-step mathematics problems. The conclusions are that teachers must be aware of the verbal orientation of students and must provide courses of instruction which will use the students' strengths to ameliorate their weaknesses. Three tables and an appendix are included. Fifty-three references are listed. (VM)

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AVERAGE NON-VERBALLY ORIENTED ADOLESCENTS-- AN AT-RISK POPULATION IN OUR SCHOOLS IMPLICATIONS FOR TEACHERS OF BLACK STUDENTS

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AVERAGE NON-VERBALLY ORIENTED ADOLESCENTS-- AN AT-RISK POPULATION IN OUR SCHOOLS: IMPLICATIONS FOR TEACHERS OF BLACK STUDENTS

The Governor's 1991 Report on Education: Time For Results (National Governor's Association, 1985) describes "At Risk" students who drop out of high school as students in any grade who tend to achieve below expected grade level standard, are over age for the grade level, have failed courses are in low academic tracks and have poor academic self esteem. According to the report, these factors make it difficult... to earn the credits needed to graduate. The Time For Results report also reviews other economic and social conditions which contribute to the designation "At Risk," describes actions taken in a variety of states to alleviate the problems faced by such students and concludes that "there is no one formula for a curriculum that schools can adopt to ensure success." Two studies reported in the current paper support the idea that there is at least one group of learners at risk of academic failure in our schools whose progress in school could be altered through careful identification and sensitive instructional intervention. This at-risk population is a group of adolescents found to have aptitude scores in the average range on educational ability tests, but whose nonverbal aptitude scores are found to be significantly higher than their verbal aptitude scores.

This paper brings together the findings of two studies conducted by the author which focus on adolescent learners with significant differences between their verbal and nonverbal aptitude scores and explores the implications of these findings for teachers of Black

students. The studies reported bring together and forge a link between the research findings of the 1930s and 1960s on psychometric testing and the research findings from learning theory to focus on achievement differences in adolescents with significantly higher nonverbal than verbal aptitude scores.

The first study, Improving the verbal performance of a group of verbally impoverished students, was conducted by the writer as a classroom teacher/graduate student in 1964 and reported as a Master's thesis at Virginia State College (now, Virginia State University). The subjects were 6th grade students in an all Black urban elementary school in central Virginia and were found to have higher nonverbal than verbal aptitude scores.

The second study was conducted by the writer as a state education agency supervisor/doctoral student and reported in 1985 as a doctoral dissertation at the University of Maryland College Park. The title of this study is Cognitive task performance in six curricular areas by average adolescents with significant differences between verbal and nonverbal aptitude scores. The subjects were 8th grade students from five school divisions in southeastern Virginia.

Perspectives and Theoretical Framework

The importance of this paper is that the combined findings of two studies conducted nearly 20 years apart calls attention to a population which continues to be at risk of academic failure in our schools and proposes that (1) aptitude data, sensitively used, can provide an

alternative to using variables such as ethnicity, socio-economic status, gender and home background in identifying and planning instruction for certain at-risk learners; (2) that strengths evidenced by nonverbally oriented learners in mathematics and science which are needed in a technological society are at risk of being lost in our verbally-oriented schools; (3) that verbal aptitude and verbal achievement of nonverbally oriented adolescents can be improved through appropriate classroom instruction; and (4) that talented Black students with higher nonverbal than verbal aptitude may be at double-risk in our schools if only verbal strengths are valued in our schools and if nonverbal aptitude strengths continue to be ignored or viewed as deficits. This paper does not intend to suggest that all Black students have higher nonverbal than verbal aptitudes. The evidence presented does, however, support the premise that learners from a variety of ethnic, socio-economic, and gender populations with higher nonverbal than verbal aptitudes may be at risk of academic failure in our schools and the premise that without planned intervention, Black students evidencing higher nonverbal than verbal aptitudes may be in double jeopardy of attaining the "at-risk" status.

Both studies reported here are influenced by Guilford (1956) whose structure of intellect model included the idea that some factors of intellect are verbal, and some, nonverbal. Both studies gain support from Tyler (1952) who stated:

> "In a world as complex as ours, a variety of talents and abilities can be utilized. The tendency of the schools to capitalize solely on verbal abilities does not take into account what could be gained by more adequately educating persons who have other talents which are needed but which often go unidentified and usually untrained." (p. 43).

This observation by Tyler, unfortunately, remains as valid in 1989 as in 1952.

The 1964 study, Improving the verbal performance of verbally impoverished students found support in a body of research literature on psychometric testing. Recognizing that intelligence testing has proven to be an anathema in the Black community and that the misuse of data from such tests has resulted in the miseducation of Black students. This paper calls attention to some positive findings from a study conducted by a Black researcher through a Black college, the significance of which might have been lost in this earlier period of social upheaval. Findings related to aptitude differences could, however, prove beneficial in unlocking potential needed in the larger society for survival in the 21st century, if sensitively used by caring educators.

A group of researchers from the 1930s to the early 1960s seemed to be moving toward a paradigm which embraced using the findings of research on intelligence as a basis for instructional planning to improve levels of intellectual functioning. Studies and theories reported during this period included some which resulted in intellect being viewed as composed of many factors, rather than as a single or unitary factor (Cautela, 1959; Guilford, 1956; L. Thurstone, 1938). Contributions of Thurstone's 1938 Primary Mental Abilities and Guilford's Structure of Intellect ushered a new era in research on testing. Studies and articles reported during this period indicated that capitalizing solely on verbal abilities did not take into account what could be gained by adequately educating persons with other types of abilities and talents

(Anatasi, 1958; R. Tyler, 1952; L. Tyler, 1956; Cronbach, 1960; and, 1960); that verbal factors may not be the best basis for judging mental capacity (Davis, 1948; Eels, 1952; Neuhaus, 1962; R. Tyler, 1952); that assumptions which present intelligence as fixed were no longer tenable, (J. McV. Hunt, 1961; P. Vernon, 1961; Doll, 1957); that aptitude can be improved through instruction or training (Guilford, 1956; L. L. Thurstone, 1938; T. G. Thurstone, 1952). Studies designed to determine if variations in patterns of nonverbal scores might have implications for instruction were reported (Gundersen and Feldt, 1960; T. G. Thurstone, 1962). This body of literature as well as an extensive review of literature on listening, speaking, reading and writing provided insights which guided my 1964 study on Improving the verbal performance of a group of verbally impoverished pupils.

In this study verbal impoverishment is defined as a lack of sufficient background of meaningful experiences with words to participate productively in learning experiences involving speaking, listening, reading and writing. A verbally impoverished pupil, then, is a pupil who evidences such deficiency. In this study, verbal intelligence as measured by the Lorge-Thorndike Intelligence Test refer to the ability to find a principle stated in written verbal symbols (words) and then to apply that principle through reasoning. Nonverbal intelligence as measured by the Lorge-Thorndike Intelligence Test refers to the ability to find a principle presented in pictorial and numerical symbols and then to apply that principle through reasoning.

The Procedure of the Study

> It is one thing for an experimental psychologist to conduct controlled learning experiments under laboratory conditions and quite another thing for a teacher to plan and guide learning experiences with 35 children for six hours a day in school...For one thing in a laboratory learning experiment there must be a right response, a specific predetermined, carefully defined act on the part of the learner which is to be accepted as evidence of "learning" ...The experimenter's objective is to vary only one factor at a time, keeping all others controlled.
>
> The teacher operates in quite a different framework. He/she wants to obtain a particular result. Learning conditions in the classroom are not simple and restricted but highly complex. Many learnings are going on at the same time and the learnings he tries to foster are far more complex than the simple tasks of the learning experiment.
>
> ...From the many differences in approach and method between laboratory and classroom, it will be apparent why it has not always been easy to apply laboratory findings to the complicated and interwoven life of a classroom. The neat generalizations that follow so clearly from controlled laboratory situations do not always throw light on the problems encountered by teachers with children.

This statement by Morse and Wingo (1955) shed light on the point of view of action research.

The purpose of the 1964 study was to determine if a planned program of verbal experiences would improve the verbal achievement and verbal intelligence scores of a group of normal and low-normal sixth grade pupils whose nonverbal intelligence scores were found to be greater than their verbal intelligence scores. This action research study, conducted in what Corey (1955) described as the "complicated psychosocial climate of ongoing school activities, sought to test the value of developing four vocabularies...the speaking, listening, reading and writing vocabularies. To determine program effectiveness, the

investigator sought to find out if the reading vocabulary, reading comprehension, grammatical usage, spelling ability and verbal intelligence scores of the subjects would increase. The planned program used a pretest-treatment-posttest design and involved five main tasks: (1) the selection of subjects, (2) the diagnosis of group needs, (3) the remediation program, (4) the developmental program and (5) the evaluation of progress, including a statistical analysis of results.

The subjects for this investigation were selected from a total sixth grade population of one hundred pupils in one school of the Richmond City School System. In September of the experimental year, thirty pupils from this group who evidenced serious verbal difficulties were assigned to the classroom of this investigator. Three sets of intelligence test data were used for the purposes of identifying and selecting subjects for the study.

The scores for identification of subjects were the scores earned in grade five on the Lorge Thorndike test. These scores provided one basis for assigning students to the class. Recognizing that the I.Q. is not always constant, the writer administered the California Test of Mental Maturity (CTMM) during the first week of school in September of the experimental year to ascertain if these pupils maintained a discrepancy between verbal and nonverbal scores and to determine if these potential subjects would evidence a nonverbal score higher than their verbal score on a different test. The CTMM, then, was another basis for selection of subjects to be included in this investigation.

The Lorge Thorndike test administered in October of the experimental year provided the baseline against which to determine the progress made by pupils during the experimental year. Pupils who earned a nonverbal score that was five or more points higher than their verbal scores on at least two of these three tests were retained as subjects.

Of the thirty pupils assigned to the class, twenty became subjects of this investigation. The other ten students remained in the class and attention was given to their individual needs. The findings reported in the study reflected only the progress made by the 20 carefully selected subjects. In addition to the verbal, nonverbal discrepancy, other selection criteria used were: (1) The total I.Q. score should be in the normal or dull normal range, and (2) the total verbal achievement score should be below the pupil's grade level.

The twenty subjects included fourteen boys and six girls ranging in age from ten to fourteen years. They were found to have, on at least two tests, nonverbal I.Q. scores ranging from 5 to 44 points higher than their verbal intelligence scores. Their total Lorge-Thorndike intelligence scores were found to range from 74 to 105. The Science Research Associates (SRA) verbal achievement level of the subjects was found to be below sixth grade and/or their classroom verbal performance had been considered inadequate by their former teachers.

A review of the educational background of the subjects revealed that thirteen of the pupils began their elementary school experience at schools other than the one they attended during the study. All of these thirteen subjects transferred to this school between grades one

and three. Seven of the subjects had repeated at least one grade in the elementary school and two had repeated four grades. Three of the subjects earlier in their school lives had been involved in a program of acceleration in which they were reported to have completed in one year, the school work that normally requires one year and a half.

The diagnostic program included, in addition to the standardized tests mentioned earlier, the following diagnostic surveys: the telebinocular visual survey, the Bringlesen speech survey, the SRA Reading survey, the phonovisual spelling survey. The results of these surveys guided the planning of the remediation program. The remediation program sought to remedy difficulties in the four vocabularies...speaking, listening, reading, and writing. The developmental program sought to provide many opportunities for applying and further developing skills acquired during the remediation program.

The evaluation program included administering the SRA Achievement test in March of the experimental school year at the end of the six-months remediation program and administering the Lorge-Thorndike Intelligence test in June of the experimental school year at the end of the eight-months program of remediation and development.

The remediation program sought to remedy difficulties in the four vocabularies--speaking, listening, reading and writing. Remediation in the areas related to the speaking vocabulary included speech therapy for thirteen subjects outside of the classroom under the guidance of the speech therapist. Within the classroom a verbal enrichment hour scheduled two days a week provided planned opportunities for oral

expression with attention to speech improvement. "Listening Skill Builders" from SRA Reading Laboratory IIb, suggested for use in grade five, provided planned listening experiences using materials one year below the grade level of the subjects. "Power Builders' from the individualized SRA Reading Laboratory IIb were used in an attempt to remediate reading difficulties. This reading program was supplemented by the use of remedial workbooks and filmstrips from Webster Publishing Company. The Webster spelling text, Goals in Spelling 6, was used for a phonetic approach to spelling. This was supplemented by the Webster remedial spelling workbook, Spelling Magic, and the Webster filmstrips, Spelling Goals. A concentrated program of instruction in the mechanics of English grammar was a part of the remediation program and sought improvement in the speaking and writing vocabularies. Six months were devoted to the remediation program.

The developmental program sought to provide many opportunities for applying and developing the skills acquired in the remediation program. Attention continued to be given to the four vocabularies. The verbal enrichment program included motivational activities designed to extend the speaking vocabulary. "Listening Skill Builders" from SRA Reading Laboratory IIc provided listening experiences commensurate with the grade-placement of the subjects. The Scott Foresman reading text, People and Progress, was used as the basal reading program supplemented by power builders from SRA Reading Laboratory IIc.

Spelling was continued, providing instruction in skills more nearly commensurate with the grade-placement of the pupils than were those

I.Q. scores for the group from the end of grade three to the end of grade four; a decline in average VIQ scores of 5.5 points from the end of grade four to the end of grade five; and an average increase of 9.1 VIQ points from the end of grade five to the end of grade six. These differences were also found to be significant at the .05 level set for the study.

The conclusions from the data gathered clearly show that the verbal achievement scores and verbal intelligence scores of verbally impoverished pupils can be improved through a planned program of verbal experiences. Instructional observations showed that pupils having greater nonverbal than verbal ability find it difficult to make generalizations concerning the structure of the English language and of words in the English language; therefore they need systematic instruction in discovering or developing rules to guide them toward better listening, speaking, reading and spelling. They also need specific training to transfer these rules to practice.

Recommendations based on the data gathered were:

1. That controlled studies, using a larger population sample be made to determine better methods of meeting the needs of verbally impoverished pupils.

2. That verbally impoverished pupils be identified early in the elementary school and provided a systematic program weighted in verbal experiences with emphasis on speaking, listening, reading and spelling.

3. That verbally impoverished pupils now leaving the elementary school be provided a similar program.

4. That these systematic programs in verbal experiences be designed with careful consideration of the nonverbal abilities of pupils, so as to aid them in reaching a level of functional literacy which will enable them to compete successfully in a verbally oriented society.

5. That all of the preceding recommendations be considered emergency measures until society and education rid themselves of the verbal bias (which leads to a waste of human resources) and plan programs to utilize the nonverbal talents as well as the verbal talents of the pupils.

Background Information, 1985 Study

The 1985 study reported in this paper builds on the ideas gained from the 1964 study which continue to require attention in today's world. The 20 year hiatus between studies is related to a period of social upheaval in American life in which social changes clearly influenced research patterns and educational practices. Continuing to pursue this line of research would have required sailing against an impenetrable tide.

Various experiences of the writer as an educational practitioner provided, however, opportunities to strengthen my confidence in the validity of the finding that the verbal aptitude and achievement of nonverbally oriented adolescents could be improved through classroom instruction. These opportunities include, but are not limited to, the

following: A grant for participation in an Intensive Summer Study Program (ISSP) at Harvard which made possible an expanded review of literature on nonverbal intelligence and which resulted in the development of a monograph entitled, We can improve I.Q. scores and school achievement, (Byrd-Smith, 1969); Interim experiences as director of a university reading center, director of a federally funded Emergency School Assistant Project (ESAP), services as a professional in education and psychology involved in teacher training at various universities, and services as a state education supervisor. Opportunities such as these provided ongoing opportunities to focus on meeting the needs of instructionally disadvantaged students and teachers. Another opportunity to update the research on nonverbally oriented learners was possible during an independent study course at the University of Maryland in 1981 which eventually led to conducting the study reported in 1985. Perceiving a linkage between theory and practice contributes to the importance of the study reported.

As reported in the previous study, the researchers of the 1950's and early 1960's were moving toward a paradigm which could embrace the use of data on intelligence to influence instructional planning related to improving the verbal performance of nonverbally-oriented learners. Nevertheless, research under the heading of verbal and nonverbal intelligence all but disappeared from the educational literature of the decade including the late 1960's and early 1970's.

Starting in the 1968-78 decade, however, research interests related to individual and group differences in learning and achievement

flourished. Investigations focusing on cognitive style (Witkin, 1976; Messick, 1976; Davey, 1976) and learning style (Dunn & Dunn, 1978) resulted in significant findings concerning factors other than intelligence which influence learning. Other studies on learning during the 1968-78 decade gave attention to such variables ethnicity, socio-economic status and home background (Jensen, 1969; Coleman, 1966; Jencks, 1972) in seeking to account for group and individual differences in school achievement.

Changing concepts of intelligence, however, became a focus in literature in the late 1970's and early 1980's when information processing psychologists such as Campione and Brown (1978); Pellegrino and Glaser (1979); and Snow (1978) seemed to be reaching at least partial consensus with researchers such as Sternberg (1982) that "intelligence can usefully be viewed as a set of thinking and learning skills that potentially, at least, can be separately diagnosed and taught" (Sternberg, 1982, p. 2). Sternberg (1981) reviewed the works of L. Thurstone (1938), Guilford (1959) and other factor-analytic researchers and suggested that cycling back to an earlier state in research may be an option in addressing educational problems of today.

This study is anchored in the framework provided by the changing concepts of intelligence emerging in the 1980's. Following the suggestion of Sternberg (1981), the plan of the current study involves (1) cycling back to an earlier period of research for findings related to verbal and nonverbal intelligence; (2) using these earlier findings as a basis for a study which recognizes intelligence as an aptitude variable which

can be diagnosed and taught, and (3) seeking from the diagnostic information gained, implications for curricular and instructional planning.

While diagnosis is the major focus of this study, an important principle of diagnosis is that diagnosis and instruction are inextricably interrelated (Heilman, 1967; Strang, 1968; Wilson, 1967,). Instructional treatment is not involved in this study; yet instruction for aptitude improvement is the desired outcome. This point of view seems supported by Wang and Lindvall (1984) who, in discussing the work of Glaser (1972) and his associates on the "new aptitude," stated:

> Of interest here is the research that has attempted to analyze what is involved in the successful completion of tasks typically found in aptitude items . . . It has been suggested that if basic components of these required aptitudes can be identified and assessed, it may be possible to provide instruction that will remediate individual weaknesses. (p. 185)

The current study attempts to analyze what is involved in the successful completion of tasks typically found in items on a standardized achievement test, rather than an aptitude test. An ability test yielding verbal, nonverbal and total aptitude scores was used to select two groups of subjects matched on a one-to-one basis by total aptitude scores, yet evidencing a difference of at least one standard deviation between their verbal and non verbal aptitude scores. All aptitude scores of the subjects were in the average range. However, one group had verbal scores higher than their non verbal scores and the other group had nonverbal scores higher than their verbal scores. Of research interest here is not only an analysis of what is involved in the successful completion of tasks found in the achievement test items, but also in an analysis of differences in the performance of these tasks by

adolescents with at least a standard deviation of difference in either direction between their verbal and nonverbal aptitude scores.

The 1985 study conducted in Virginia by the writer investigated differences in cognitive task performance of adolescents with ability scores in the average range, but with statistically significant differences between verbal and nonverbal aptitude scores. The investigation sought to determine if there are differences in nonverbal learners and verbal learners in performance on certain tasks in reading, mathematics, language, reference materials, social studies and science.

The subjects involved in the study included 100 eighth grade students from five school divisions in central Virginia--four rural and one urban. SRA Educational Ability Series (EAS) data for 1,480 8th grade students in the five school divisions were used in selecting a two-group sample with 50 subjects in each group.

Conceptual Framework, 1985 Study

Dewey (1900) envisioned that a linking science was needed to provide a conceptual framework in which knowledge obtained from research and knowledge gained from educational practice "could interact, cumulate, and modify each other." (Glaser, 1982, p. 203) The procedures used in this study are based on a conceptual framework. Some of the ideas undergirding the procedures were derived by combining knowledge gained from research and knowledge gained from educational practice. The result of this combination is a conceptual framework proposed by the author to facilitate interaction between theory and practice.

From Guilford, Fruchter and Kelley (1959) come the idea that it is within the content categories that the distinction between verbal and nonverbal tests is found; from Carroll (1976) comes the idea for interpreting psychometric tests as cognitive tasks. From Meeker (1968) and from Guilford and Hoepfner (1971) come the idea that cognitive processes can be identified using intelligence as well as achievement tests, and from Guilford (1967, 1979) comes the idea that the content in which tasks on educational activities are presented is related to perception and that perceptual differences influence cognition. From Byrd-Smith (1964, 1973) comes the idea that performance differences in high nonverbal learners may be related to perceptual (or input) factors of intellect activated by the content in which tests or learning activities are presented. The conceptual framework on which the procedures of the study are based is as follows:

1. Students' performance on cognitive tasks presented on standardized achievement tests can provide an index to perceptual differences in adolescents with statistically significant differences in verbal and nonverbal aptitude scores.

2. Identification of and respect for perceptual differences between verbally oriented and nonverbally oriented students can provide valuable diagnostic information. This diagnostic information can be used to enhance curricula and instructional planning designed to meet the achievement needs of adolescent learners in reading,

mathematics, language, use of reference materials, social studies, and science. The procedures used were based on the proposition that:

a. Subskills measured on a standardized achievement test are indexes cognitive tasks.

b. Scores earned on the subskills of the achievement test used can provide data to test the hypotheses of the study.

3. Descriptions of the items measured on the achievement test as described in the technical manuals provided by the publisher can provide insight concerning the cognitive tasks the students are required to perform in taking the test.

4. Decisions can be made concerning whether the tasks required on the achievement test are presented in semantic, figural, symbolic, or behavioral form by examining achievement test content using as a guide Guilford's (1959) structure of intellect model.

5. Definition of each content category as presented by Guilford (1957) and interpreted by Meeker (1968) can be used to classify the content of each subtest.

6. Using the codes proposed by Guilford (1956, 1959), each cognitive task on achievement test can thus be coded (M) if the task involves semantic content; (F) if the task involves figural content; (S)

if the task involves symbolic content or (B) if the task involves behavioral content.

Procedures of the 1985 Study

The purpose of the study was to determine if there were differences in the performance of cognitive tasks in (1) reading, (2) mathematics, (3) language, (4) reference skills, (5) social studies and (6) science between two groups of adolescents with total aptitude sores in the average range as measured by the Science Research Associates Educational Ability Series. One group had higher nonverbal than verbal aptitude scores, the other had higher verbal than nonverbal aptitude scores.

The study used an ex post facto design. According to Mouly (1970) the ex post facto experiment begins with a given effect and seeks the experimental factor that brought it about. This study began with a given effect (student achievement on a standardized test) and sought to determine if differences in verbal and nonverbal aptitude contributed to the differences in achievement. The investigator had no control over the instructional factors nor the experimental, environmental, or natural factors which may contribute to differences in achievement.

Population

The subjects were selected from the total eighth grade population in five of the 140 school divisions in Virginia. Four are rural and one is urban. Two of the rural divisions have a predominantly white population and two have a predominantly Black population. The 1,480

students enrolled in eighth grade in the five school divisions and who took the SRA achievement tests and educational ability tests in March 1984 were the population from which subjects for this investigation were selected.

Selection of subjects

Three variables involved in the problem of this study are aptitude differences, achievement differences and cognitive task performance differences. Selection of the subjects provided insights concerning aptitude differences.

Selection of subjects was based on two determinants: (1) EAS total ability score in the average range and (2) one standard deviation of difference between nonverbal and verbal ability scores. Assignment to a nonverbal or verbal group was based on having a total ability score the same or almost the same as a member of the opposite group.

The Educational Ability Series is an ability measure available for use in conjunction with forms 1 and 2 of the SRA Achievement Series. The EAS contains six subtests at each of eight levels (A-H) and yields a total ability score and subscores of verbal and nonverbal skills. The EAS subtests at level G, used in the current study measure vocabulary, number and series, spatial transformations and word grouping. EAS scores are reported in terms of the number of correct responses to 55 items presented in the test. This test was not selected through comparison of several tests and because of any unique qualities it possesses. It was selected because it is a part of the Virginia State Assessment

program and data from this instrument are available to teachers in Virginia for making certain decisions about instructional planning.

Scores for each of the subtests were available to the investigator, as a state agency supervisor, with approval of the State Superintendent of Public Instruction and support of the Administrative Director of Research and Testing. A Skills Evaluation Chart developed by the Educational Computing Software Company (ECS) in cooperation with the Virginia Department of Education is used in reporting data from the SRA achievement Series and the Educational Ability Series. Columns on this chart identify each subtest and subskill score earned by a student as "Below Average", "Average", or "Above Average". Using these designations on the ECS Skills Evaluation Chart, only students whose total EAS scores were recorded in the average column and who were found to have statistically significant differences between their verbal and nonverbal EAS ability scores were considered eligible for selection as subjects. The 100 subjects selected (50 in each group) were those whose total EAS score was the same or almost the same as a student considered for selection in the alternate group.

The importance of the aptitude variable in the overall outcomes of the study suggests that sharing the subject selection data in the context of this paper may be valuable. Careful review of these data can provide valuable insights concerning aptitude differences which might encourage educational practitioners to determine if such differences are extant in their schools or classrooms.

SEE TABLE 1 NEXT PAGE.

TABLE 1

Differences between Verbal and Nonverbal Scores of Two Groups with Similar Total Ability Scores

Group I-Nonverbal					Group II-Verbal				
1	2	3	4	5	6	7	8	9	10
Student Code	Division Code	EAS Total	Verbal Scores	Non-Verbal Scores	Student Code	Division Code	EAS Total	Verbal Scores	Non-Verbal Scores
001	A	19	4	15	051	C	18	15	3
002	E	19	5	14	052	C	19	15	4
003	E	20	6	14	053	C	20	17	3
004	A	21	7	14	054	C	20	16	4
005	C	21	7	14	055	B	20	16	4
006	A	22	8	14	056	E	22	15	7
007	A	22	8	14	057	E	22	14	8
008	A	22	8	14	058	C	22	16	6
009	E	22	6	16	059	B	22	16	6
010	B	22	8	14	060	A	22	16	6
011	B	22	8	14	061	A	23	16	7
012	A	23	8	15	062	A	23	18	5
013	A	23	7	16	063	E	23	18	5
014	A	23	9	14	064	E	23	16	7
015	A	23	6	17	065	C	23	18	5
016	A	23	7	16	066	A	24	17	7
017	A	23	8	15	067	A	24	17	7
018	A	23	7	16	068	A	24	17	7
019	A	23	8	15	069	A	24	16	8
020	A	23	9	14	070	A	24	16	8
021	B	24	6	18	071	A	24	17	7
022	C	23	9	14	072	E	24	16	8
023	C	23	9	14	073	C	24	16	8
024	E	23	9	14	074	B	24	17	7
025	C	25	7	18	075	A	25	17	8
026	A	26	9	17	076	A	26	19	7
027	A	26	6	20	077	A	26	20	6
028	E	26	9	17	078	A	27	19	12
029	A	28	9	19	079	A	28	20	8
030	D	28	8	20	080	E	28	21	7
031	A	29	8	21	081	E	28	20	8
032	A	29	9	20	082	C	29	22	7
033	A	30	10	20	083	C	30	22	8
034	B	30	10	20	084	A	31	24	7
035	A	31	12	19	085	A	31	24	7
036	E	31	9	22	086	A	31	22	9
037	A	32	12	20	087	A	32	21	11
038	D	32	13	19	088	A	32	21	11
039	D	32	12	20	089	E	32	21	11
040	A	33	13	20	090	B	33	23	10
041	E	33	13	20	091	B	33	21	12
042	A	34	15	19	092	A	34	24	10
043	D	34	15	19	093	E	34	23	11
044	B	34	15	19	094	A	34	22	12
045	D	35	15	20	095	E	35	24	11
046	D	35	14	21	096	E	35	25	10
047	B	35	14	21	097	E	35	25	10
048	D	36	13	23	098	D	36	23	13
049	A	37	14	23	099	B	37	25	12
050	E	39	15	24	100	B	39	27	12

Table I shows in columns three and eight that the EAS total scores for the two groups were the same or varied by only one point. The range of total scores for the nonverbal group ranged from 19 to 39 and the range of total EAS scores for the verbal group ranged from 18 to 39. Scores of the national sample with which these students' scores are compared averaged 27.9, which represented the average number of correct responses made by the national group. The obtained scores of the subjects were found to fall in an area representing +1 or -1 standard deviation from the mean. Observation of columns four and five for the nonverbal group and columns eight and nine for the verbal group show that there are dramatic differences in the verbal and nonverbal subskill scores of two students who may have the same total score.

Attention is called to the student coded 007 and the student coded 058, a matched pair whose total EAS score of 22 is exactly the same, yet, the verbal and nonverbal scores of these subjects are the inverse of each other. This exact inverse pattern is also observed in comparing the scores of students coded 025 and 075 and in comparing the scores of students coded 027 and 077. Even in instances in which the score patterns are not in an exact inverse relationship, observation of the data shows clearly that two students with the same or almost the same aptitude scores may have aptitude strengths which are quite different and may thus require different instructional approaches.

Achievement

A second variable in the problem of this study is achievement. Procedures related to achievement in this study involved recording from the ECS Student Evaluation Chart subskill, subtests, and grade equivalent scores in six curricula areas for each of the 100 subjects; determining the means, standard deviation, standard error of measurement for each of the tests and subtests to be studied; and determining the significance of the differences between means of each group in each subject area measured.

The achievement tests scores earned by each of the 100 subjects were recorded on a COBOL Coding form and keypunched for statistical calculation by computer.

Six research questions were posed which asked are there statistically significant differences between selected nonverbal adolescent learners (NVAL)and selected verbal adolescent learners (VAL) in performance on certain tasks in each of six subject fields, reading, mathematics, language, reference materials, social studies and science. Null hypotheses and subhypotheses were stated indicating that there was no statistically significant difference between selected NVAL and VAL in task performance on the six major tests, the 11 subtests and the 36 subskills measured in the SRA Achievement Series. Fifty three t tests were performed to evaluate the significance of differences found. The general computer program used in calculating the statistics on the data was the Statistical Package for the Social Sciences (SPSS) (2nd edition; Nie, Hull, Jenkins, et. al., 1975). For each null hypothesis, the .05

level of statistical significance was chosen for accepting or rejecting the hypothesis.

Results

Five of the research questions (Was there a statistically significant difference?) were answered yes, because statistically significant differences were found within the subtests or subskills favoring the verbal group in reading, language, reference materials and social studies. Statistically significant differences were found within the subtests or subskills favoring the nonverbal group in mathematics. The answer to one research question was no, because no statistically significant differences were found between the verbal and the nonverbal groups in science. This finding was considered to reflect the strength shown in science by the NVAL group.

SEE TABLE 2 NEXT PAGE.

TABLE 2

Summary of Significant Differences on SRA Achievement Test Subtests and Subskills

Significant Differences			
Differences Favoring NVAL		Differences Favoring VAL	
Mathematics		Reading	
Geometry, Measurement	$p < .05$	Vocabulary	$p < .01$
Multiple-Step Problems	$p < .05$	Literal Meaning	$p < .01$
Mathematics Grade Equivalent	$p < .05$	Nonliteral Meaning	$p < .01$
		Comprehension	$p < .01$
		Grasping Details	$p < .05$
		Summarizing	$p < .05$
		Drawing Conclusions	$p < .01$
		Reading Grade Equivalent	$p < .01$
		Language	
		Pronoun Modifiers	$p < .05$
		Spelling	$p < .01$
		Reference Materials	
		Dictionary	$p < .05$
		Social Studies	
		Social Studies	$p < .05$
		Sociology, Anthropology	$p < .05$
		History, Government	$P < .05$
N = 3		N = 14	

As shown in Table 2, statistically significant differences between the NVAL and VAL groups were found in 14 subtests or subskills which favored the VAL group. Only three statistically significant differences were found to favor the NVAL group. These NVAL differences were in the subskills of geometry and measurement in the math concepts subtest, the subskill of multiple-step problems in the math problem-solving subtest, and the overall grade equivalent score in mathematics. These findings related to achievement dramatically demonstrate why the title of this paper suggests that students with higher nonverbal than verbal aptitude scores may be an at-risk population in our schools.

Cognitive Tasks Performance Differences

The third variable in the problem of the study, cognitive task performance differences, will not be fully discussed in this paper. The details and background information involved in the analysis of cognitive task performance are beyond the intent of this paper and will be presented in another paper on this topic. Because the achievement differences found between the two groups did not yield enough information concerning the NVAL group for an adequate analysis, a second review of the data was made to identify additional areas in which the NVAL group scored higher than the VAL group, even through the between group differences were not statistically significant. It was deemed necessary by the investigator to identify as many strengths of this group of learners as possible. Such information might prove useful in an analysis designed to help teachers identify the cognitive strengths of each group of learners in an effort to better meet their instructional needs.

SEE TABLE 3 NEXT PAGE.

TABLE 3

Cognitive Task Analysis Code Representing Content Category in Which Each Group Scored Higher

Differences Favoring NVAL	Code	Differences Favoring VAL	Code
**Understanding the Author	M	*Literal Meaning	M
		*Nonliteral Meaning	M
Fractions and decimals	S		
*Geometry, Measurement	F, S	*Grasping Details	M
Pre-Algebra	S	*Summarizing	M
		Perceiving Relationships	M
Whole numbers	S	*Drawing Conclusions	M
Fractions, Mixed Nos.	S	**Understanding the Author	M
Decimals, Money and Percent	S		
Signed Numbers	S	**Geometry, Statistics	M, S
Fractions and Decimals	M, S	Verbs	M
*Multiple Step Problems	M, S	*Pronoun Modifiers	M
Rate, Proportion, Percent	M, S	Clarity of Expression	M
**Geometry, Statistics	F, M S	Sentence Transformation	M
Capitalization	M, S	*Language Spelling	M, S
Punctuation	M, S		
		*Dictionary	M, S
Sentence Structure	M	Source of Information	M
		Maps, Tables, Graphs	M, F
		Parts of a Book	M
		*Social Anthropology	F,M,B
		*History, Government	F,M,B
		Geography, Economics	F,M,B
		Knowledge	F, M
		Concepts, Principles	F, M
N = 13		Process	F, M
		N = 21	

** Performance equal in both groups - 2

Codes: M = Semantic
S = Symbolic
F = Figural
B = Behavioral
* = Significance
** = Performance equal in both groups

Table 3 shows that the VAL group performed better than the NVAL on 21 cognitive tasks and that performance differences on ten of these tasks were significantly different. Table 3 also shows that the NVAL group performed better than the VAL group on 13 cognitive tasks and that performance differences on only two of the tasks were statistically significant. The performance of the two groups were exactly the same on two tasks.

These data were used in an analysis in which the Guilford Structure of Intellect model was used to identify the cognitive processes required for adequate performance of cognitive tasks involved in responding to items on the SRA Achievement test. Identifying such processes could prove useful for instructional planning. Because teachers have traditionally been turned off by the complex appearances of Guilford's Structure of Intellect model, a revised version of the Guilford Model was developed by the writer and presented in this study to facilitate such analyses and to facilitate a transfer from theory to practice. (See Appendix A.)

Conclusions

Conclusions supported by the findings of this study are as follows:

Adolescents who have statistically significant differences between EAS nonverbal and verbal aptitude scores, but who have total EAS scores in the average range show different patterns of performance on achievement tests.

Adolescent learners with higher verbal than non verbal EAS scores and whose total scores are in the average range may evidence better school achievement in reading, language, social studies, and science than adolescents with higher nonverbal EAS scores.

Adolescent learners with higher nonverbal than verbal EAS scores may evidence better achievement in mathematics than adolescents with higher verbal EAS scores.

The analysis of cognitive task performance using the Guilford Structure of Intellect model suggests that adolescent learners with higher verbal than nonverbal EAS scores and with total EAS scores in the average range may evidence strength in the performance of cognitive tasks involving semantic content and adolescent learners with higher nonverbal than verbal EAS aptitude scores and with total EAS scores in the average range may evidence strength in the performance of cognitive tasks involving symbolic content. The evidence strongly suggests that additional research and instructional attention is needed in order to improve the verbal performance of learners with higher nonverbal than verbal aptitude in order that they might better exhibit and use their logical reasoning and problem solving talents in a verbally oriented society. Additional research and instructional attention is also needed in order to improve the logical reasoning and problem solving aptitudes of learners with higher verbal than nonverbal aptitudes.

IMPLICATIONS FOR TEACHERS OF BLACK STUDENTS

The 1964 study, Improving the verbal performance of a group of verbally impoverished pupils, demonstrated conclusively that both the verbal achievement scores and the verbal aptitude scores of a group of sixth grade Black students in an urban school were improved significantly through a planned program of verbal experiences. The 1985 study reported in this paper shows that these verbal-nonverbal differences also are found in students of various ethnic, socio-economic groups from both urban and rural environments in today's world. It would be unfortunate if the findings of these studies were interpreted to suggest that all Black students have higher nonverbal than verbal aptitudes. It is proposed, however, that if students with high nonverbal aptitudes are falling behind in most subject areas in our verbally oriented schools, then if a student with higher nonverbal than verbal aptitudes happens to be Black, he/she may be doubly at risk of falling behind in school and, thus, the chance that he/she may drop out doubles.

These studies do not provide any magic answers, but they do raise a new set of questions concerning what it means to be adolescent, Black and high nonverbal. The finding that students of any race with higher nonverbal than verbal aptitudes may not be achieving as well as they might in our schools is a cause for grave concern by members of all ethnic groups. Concern should lead to action. The finding that such students evidence consistently high performance in mathematics should be a cause of grave concern to the entire nation, if during this technological era in which math is so crucial for competitiveness in a global community, the potential of these students may be lost.

Another finding available through examining the tables and text of the 1985 study is that even though the nonverbally oriented group was found to score less well than the verbally oriented group in science, the average grade placement score for the NVAL group was above their actual grade placement level at the time of the test. The fact that a group of nonverbally oriented learners whose reading scores were found to be one year and eight months (1.8) or nearly two years behind their verbally oriented colleagues in reading, were, nevertheless, able to score significantly higher than their verbal partners on multiple step problem solving and above grade level in science strongly suggests that this is a population requiring the finest attention of the nation. Tables delineating these findings are available upon request.

An article by Iwanike (1981) reviewed in the 1985 study reports that a new generation of achievement batteries include optional aptitude measures that can be administered along with achievement tests. Through using such tests, he states that school personnel can assess student's achievement as it relates to their ability. I am more than aware of problems that have been faced by the Black community through the misuse of test data. Yet, if short aptitude tests of educational ability which identify strengths in verbal or nonverbal aptitudes can be used to improve instructional planning, this certainly might prove better than using such vague criteria as ethnicity, gender, geographical regions, home background, and socio-economic status as a basis for instructional planning. In working with Blacks, or with any ethnic group, teachers might be well advised to consider the five themes for teachers delineated

in first century Rome by Quintillian. These five themes for teachers as reported by Snow (1983) and reviewed in my 1985 study are:

> (1) Identify apparent aptitudes and inaptitudes for each learner;
>
> (2) help develop aptitudes by differentiating courses of instruction, allowing individual educational goals. Guide learners in choosing courses according to their aptitudes;
>
> (3) within a course of instruction toward a common goal, seek to develop all relevant aptitudes even if some are weak at the start; adapt alternative instructional treatments to the individual's aptitude pattern, so as to remove defects and to build up strengths where they are lacking;
>
> (4) use the individual's strengths to work on the weaknesses. Teaching that runs counter to an individual's aptitudes may actually weaken those aptitudes (emphasis added);
>
> (5) even if, below a certain level of general intelligence, little can be done other than to choose goals in keeping with special aptitudes, above that general level, appropriately adapted instruction can bring initially weak aptitudes up to equal other prior strengths. (Snow, 1983, p. 8)

Such an approach could improve academic performance of students from any ethnic group whether verbally or nonverbally oriented. Attention to these five themes seem, however, especially important in meeting the instructional needs of Black students with higher nonverbal than verbal aptitudes.

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Appendix A
An Interpretation Of
Guilford's Structure of Intellect Model

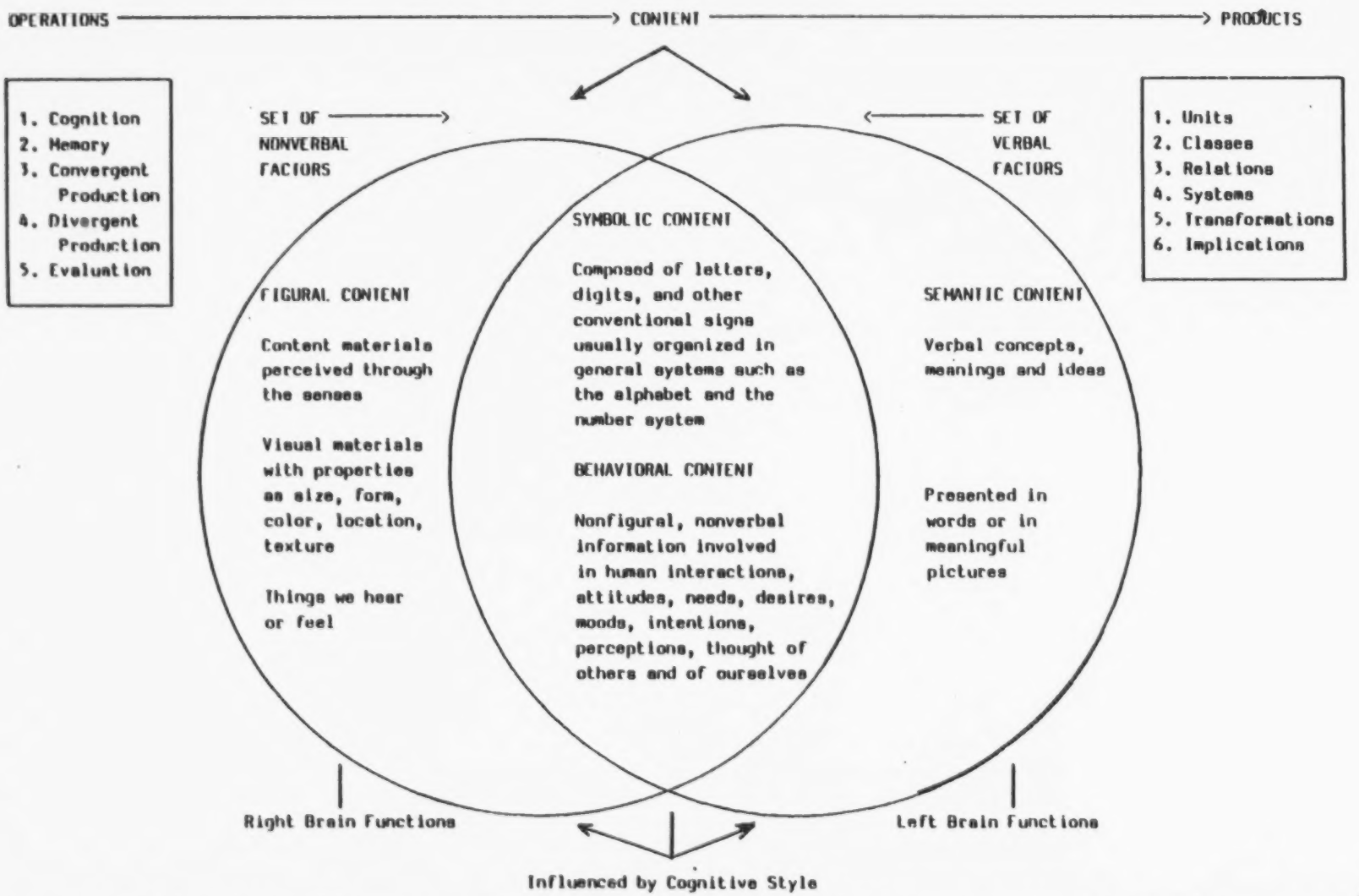
OPERATIONS
CONTENT
PRODUCTS
1. Cognition
2. Memory
3. Convergent Production
4. Divergent Production
5. Evaluation
SET OF NONVERBAL FACTORS
SET OF VERBAL FACTORS
1. Units
2. Classes
3. Relations
4. Systems
5. Transformations
6. Implications
SYMBOLIC CONTENT
Composed of letters, digits, and other conventional signs usually organized in general systems such as the alphabet and the number system
FIGURAL CONTENT
Content materials perceived through the senses
Visual materials with properties as size, form, color, location, texture
Things we hear or feel
SEMANTIC CONTENT
Verbal concepts, meanings and ideas
Presented in words or in meaningful pictures
BEHAVIORAL CONTENT
Nonfigural, nonverbal information involved in human interactions, attitudes, needs, desires, moods, intentions, perceptions, thought of others and of ourselves
Right Brain Functions
Left Brain Functions
Influenced by Cognitive Style

Figure 1. An Interpretation of Guilford's (1959) "Three Faces of Intellect" (1969) and the relationship of Guilford's ideas to brain functions and cognitive style. Source: LaVerne Byrd-Smith, 1974 and 1983